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On a New Nematode of the Genus *Mecistocirrus*  
from the Cattle in Japan, with Remarks  
on the Generic Diagnosis.

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*With 1 Plate and 1 Text-figure.*

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Only two species of the nematode genus *Mecistocirrus* have hitherto been reported from ruminants. Both are from eastern Asia. Von Linstow (1906) described a species, *Strongylus digitatus* (= *Mecistocirrus digitatus*), from the zebu (*Bos indicus*) in Ceylon, and Railliet and Henry (1912) examined specimens of the same species from Sumatra. The second species is *Strongylus fordi* (= *Mecistocirrus fordi*), first reported by Daniels (1908) from the cattle (*Bos taurus*) in the East Indies, and to this species is to be referred the *Strongylus gibsoni* of Stephens (1908) from the stomach of the pig and the intestine of man in China.

In Japan a nematode has long been known to occur commonly in the stomach of the cattle (*Bos taurus*) and has often been erroneously identified as *Haemonchus contortus* from such superficial resemblance as the spiral twisting of the ovaries around the intestine. S. Taguma (1918) pointed out that the worms in question are very different from *Haemonchus contortus*, and gave comparative measurements of the two nematodes, without, however, pointing out characters of systematic importance. Thanks to his kindness I have recently been enabled to collect numerous specimens of this nematode at the slaughter house in Tokyo, where he is stationed, and to study them. As a result of a closer examination I

have come to the conclusion that this nematode is to be referred to the genus *Mecistocirrus* and new to science. I therefore propose the name of *Mecistocirrus tagumai* for it, in honour of Mr. S. Taguma mentioned above, and to submit some notes on it.

Before proceeding any farther, I must express my warmest thanks to Prof. S. Goto for his constant supervision and valuable suggestions during my work.

### General description of *Mecistocirrus tagumai*, n. sp.

The body is rather slender and cylindrical in shape, tapering more markedly anteriorly than posteriorly. The broadest part of the body lies just behind the middle in the female, and somewhat more posteriorly in the male. The cuticle shows everywhere very fine transverse and longitudinal striations, the latter being especially conspicuous near the two ends of the body. As to the longitudinal ridges of the cuticle there are 30 of them anteriorly and 34 more posteriorly, but they are externally not prominent and restricted to the anterior part of the body. Along the ridges the cuticular substance remains unstained with Delafield's haematoxylin, so that in transverse sections a small, nearly elliptical, light space is seen under apex of each ridge.

The cuticular inflation of the head and neck is marked, extending nearly from the anterior end of the head posteriad for about 0.33 mm., with distinct surface striations. The mouth is a terminal dorso-ventral slit and has no lip. On each side of the orifice there are three minute papillae, of which the middle one is the largest; dorsally and ventrally there is a V-shaped lip-like structure, with the apex of the V directed outwards. The buccal cavity is shallow, measuring about 0.01 mm. in depth, and broader dorso-ventrally. It leads directly into the muscular claviform oesophagus, which gradually increases in diameter posteriad, its length being about  $1/18$  of the body length. The nerve ring lies at the end of the first  $1/5$  of the oesophagus. The excretory pore opens

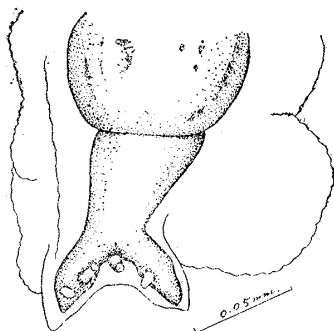
just behind it. The cervical papillae are conical, small, but conspicuous, and project vertically each from a small depression in the cuticle, at the same level as the end of the first  $1/4$  of the oesophagus.

Measurement in Millimeters.

	Oesophagus		From anterior end to		
	length	max. width	nerve ring	excretory pore	cervical papillae
♂	1.8—2	0.15—0.17	0.34	0.39—0.44	0.49—0.59
♀	1.9—2.1	0.17	0.3—0.37	0.36—0.4	0.49—0.54

The males measure 25–31 mm. in length and 0.49 mm. in maximum thickness. The bursa copulatrix has only the lateral lobes, which are well developed, without a median lobe. In the natural condition each lobe is a concavo-convex lanceolate expansion, with the tip of one (usually the right) folded over that of the other. At the base of the lobes, on either side, a strong wing-like muscle is seen radiating from the median line to the lateral margin of the body. When pressed flat under a cover slip the lateral lobe has almost the shape of a tobacco leaf, and measures about 0.78 mm. by about 0.53 mm. It is marked on both surfaces by fine elongated irregular foldings and is markedly thickened along the middle in its proximal half besides having on its inner surface many small bosses in the region of the rays. There are six pairs of supporting rays. The externo-dorsal ray starts from the base of the lateral rays, proceeds nearly at right angles to them, with the distal part curved slightly dorsalward, thus determining a small secondary lobe in the border of the lateral lobe. The postero-lateral and medio-lateral rays are very strongly developed, and fused together for the most part, leaving a mere boundary line between them, and separating only near the end; the terminal part of the postero-lateral ray curves slightly dorsalward, and corresponds to an indentation of the border; the medio-

lateral ray extends farther, curves ventralward, and reaches nearly to the posterior tip of the lobe. The externo-lateral ray runs at first parallel and close to the medio-lateral, and after separating from the latter it curves ventralward and terminates close to the tip of the latero-



Text-figure 1.  
*Mecistocirrus tagumai* n. sp.  
Ventral cylindrical appendage  
of male, ventral view.

ventral ray. The latter is almost parallel with the externo-lateral ray, and its tip curves slightly towards that of the latter. The border of the lobe shows near the tip of the latero-ventral ray an indentation which is far less conspicuous than the one corresponding to the postero-lateral ray. The ventro-ventral ray, the slenderest of all, is almost parallel with the latero-ventral, but curves suddenly ventralward near the tip, which reaches nearly to the border of the lobe and brings about

a slight secondary lobe there. The thickness of the externo-dorsal, externo-lateral, and latero-ventral rays is about equal ; the medio-lateral ray is about three times as thick, and the postero-lateral ray is but little more slender than the medio-lateral.

At the posterior end of the body between the lateral lobes of the bursa there are the so-called median appendages, consisting of a dorsal conical subcuticular process covered over by a cuticle with fine striations and small bosses and bordered on either side by a membranous appendage, and a ventral cylindrical appendage with bifid terminations bearing four somewhat tall papillae.

For about 0.9 mm. just in front of the bursa the body presents more or less marked lateral inflations, where the cuticle measures about 0.1 mm. in maximum thickness and presents usually an irregular surface. The prebursal papillae, which lie close to the bursa, are somewhat cylindrical and dorso-lateral in position. The two spicules are equal in size, similar in form, and very long, measuring 6-7 mm., therefore equal to about one fourth of the entire body length. They are divergent at

the anterior end, but approach each other very soon and run parallel to each other to again separate and come together at the tip, thus enclosing a fusiform area between. For a portion of their parallel course in the body they are connected by a thin membrane both dorsally and ventrally. They always protrude more or less outside the body.

The females measure 29-43 mm. long by 0.66-0.68 mm. in maximum thickness. The tail is conical and almost pointed at the end, which usually curves somewhat ventrad. The anus lies 0.14-0.15 mm. from the posterior extremity. The vulva, a transverse sickle-shaped slit, stands very near to the anus, and 0.26-0.35 mm. from the tail tip; it does not lie exactly in the mid-ventral line, but somewhat to the right side. The ovaries, which begin at different levels about 2 mm. from the anterior end of the body, run posteriad parallel with each other and spirally wound around the intestine. The oviducts are short. The uteri measure about 3.1 mm. in length and are full of eggs. The ovijector consists of an inferior and a superior non-muscular and a common muscular part. Between each non-muscular and the common muscular part there is no sphincter. The vagina, 3.3-4 mm. long, is connected with the common muscular part of the ovijector at its middle. The eggs in the vagina, ovijector, and uteri are symmetrically ellipsoidal or somewhat long ellipsoidal, measuring 0.095-0.12 mm. by 0.05-0.06 mm., and are in the segmentation stages.

In front of the vulva there is a prominent barrel-shaped dilation of the body with the diameter of 0.61-0.71 mm. and standing in marked contrast to the portion just preceding, measuring only 0.42-0.49 mm., a characteristic which is readily seen macroscopically even in a living worm. Another remarkable point is that the lateral lines change sides, the left one going over to the right side along the ventrum and the right one to the left side along the dorsum, so that in a dorso-ventral view of the body the two appear decussated in the anterior part of the swelling. The rows of somatic muscle cells also undergo the same change in direction. This fact can be readily recognized in total preparations.

As may be seen from the foregoing descriptions this species is most nearly allied to *Mecistocirrus fordi* (Daniels), but is distinguished from it by the greater size and the presence in the female of a prominent dilation in the posterior part of the body, where the lateral lines and rows of somatic muscle cells undergo a remarkable change in direction,—a fact not known in either of the two known species—and the close proximity of the vulva to the anus. These characters also differentiate it from *M. digitatus*.

Railliet and Henry (1912), when they established the new subgenus *Mecistocirrus*, included in their subgeneric diagnosis the character that there are 18 longitudinal cuticular ridges, and this character was taken over by Neveu-lemaire (1914) into his generic diagnosis when he raised the subgenus to the rank of a genus. According to my observations on the new species and another one collected from the stomach of *Bubalus bubalus* in Formosa, and doubtless identical with *M. digitatus* (Linstow), the number of longitudinal cuticular ridges, which are restricted to the anterior part of the body in both sexes, is greater. From this fact and some others which I have ascertained on the two Japanese species, and from the descriptions of *M. fordi* by several authors it now appears to me necessary to revise the generic diagnosis as follows:

Genus ***Mecistocirrus*** Neveu-Lemaire, 1914.

Syn. *Nematodirus* (*Mecistocirrus*) Railliet and Henry, 1912.

Generic diagnosis.—*Trichostrongylidae* with cylindrical, filiform body, more tapering anteriorly than posteriorly. Cuticle of head and neck inflated, finely striated transversely. Anterior part of body with improminent longitudinal cuticular ridges, anteriorly usually 30 in number, posteriorly 34. Mouth a dorso-ventral slit surrounded by six inconspicuous papillae, of which the two lateral ones are largest. Nerve ring on anterior part of oesophagus. Excretory pore just behind the nerve ring. Cervical papillae small, but distinct.

Bursa copulatrix consisting of only two well developed lateral lobes, median lobe lacking. The lateral lobes curved inwards towards the median line, with the tip of one folded over that of the other, and with six supporting rays in each. Externo-dorsal ray starting from base of lateral rays, and almost straight. Postero-lateral and medio-lateral rays conspicuously developed, fused for the most part and separated only near the tip, which is curved dorsad in the former and ventrad in the latter. Externo-lateral ray proximally close to medio-lateral ray, distally curved ventrad, away from the latter, the tip ending near that of latero-ventral ray. Ventral rays nearly parallel, but not very close together and distally more separated; tip of latero-ventral ray curved dorsad and ending near that of extero-lateral ray; ventro-ventral ray curved slightly ventrad. A dorsally situated conical process and a ventrally situated cylindrical appendage between the lateral lobes, the cylindrical appendage bifid at the tip and bearing four small papillae. Spicules slender, very long, parallel except at the anterior part. Prebursal papillae present.

Females larger than males. Vulva close to anus. Ovaries usually parallel for the most part, twisted spirally around the intestine. Vagina very long. Eggs ellipsoidal, in segmentation stages when laid. Tail narrowing abruptly, tip pointed.

Type species.—*Mecistocirrus digitatus* (Linstow, 1906).

The species occurring in ruminants are characterized as follows :

*Mecistocirrus digitatus* (Linstow, 1906) Neveu-Lemaire, 1914.

Syn. *Strongylus digitatus* Linstow, 1906.

*Nematodirus digitatus* (Linstow) Railliet and Henry, 1909.

*Nematodirus* (*Mecistocirrus*) *digitatus* (Linstow) Railliet and Henry, 1912.

Specific diagnosis.—Longitudinal cuticular ridges anteriorly 30, posteriorly 34.

Male 18–24 mm. long by 0.35–0.44 mm. in maximum width. Bursa nearly twice as long as wide. No cone in the border of lobe near the externo-dorsal ray. Spicules relatively short, measuring 3.8–4.54 mm. long, or about  $1/6$ – $1/5$  of body length.

Female 19–30 mm. long by 0.33–0.58 mm. in maximum breadth. Posterior body slender. Vulva 0.47–0.56 mm., anus 0.13–0.17 mm. from tail tip. Eggs 0.097–0.118 mm. by 0.045–0.055 mm.

Habitat.—Stomach of *Bos indicus*, *Bos taurus*, and *Bubalus bubalus*.

Localities.—Ceylon, Sumatra, Formosa.

*Mecistocirrus fordii* (Daniels, 1908) Neveu-Lemaire, 1914.

Syn. *Strongylus fordii* Daniels, 1908.

*Strongylus gibsoni* Stephens, 1909.

*Nematodirus fordii* (Daniels) Leiper, 1911.

*Nematodirus gibsoni* (Stephens) Railliet, 1912.

*Nematodirus* (*Mecistocirrus*) *fordii* Railliet and Henry, 1912.

Specific diagnosis.\*—Male 19–21 mm. long by 0.4–0.44 mm. in maximum width. Bursa nearly as long as wide. Cone in the border of lobe near the externo-dorsal ray present. Spicules very long, measuring 6.2–7.5 mm. long, or about  $1/4$ – $1/3$  of body length.

Female 21–25 mm. long by 0.5 mm. in maximum breadth. Posterior body slender. Vulva 0.5–0.6 mm., anus 0.2 mm. from tail tip. Eggs 0.11 mm. by 0.053 mm.

Habitat.—Stomach and intestine of *Bos taurus*, stomach of *Sus scrofa domesticus*, and intestine of *Homo sapiens*.

Localities.—East Indies, China (Hong Kong).

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\*The number of longitudinal ridges is not given by any author for this species.



***Mecistocirrus tagumai*, n. sp.**

Specific diagnosis—Longitudinal cuticular ridges anteriorly 30, posteriorly 34.

Male 25–31 mm. long by 0.49 mm. in maximum width. Bursa somewhat longer than broad. Cone in the border of lobe near the externo-dorsal ray present, but not prominent. Spicules long, measuring 6–7 mm. long, or about  $1\frac{1}{5}$ – $1\frac{1}{4}$  of body length.

Female 29–43 mm. long by 0.66–0.68 mm. in maximum breadth. Posterior body with a barrel-shaped dilation, where the lateral lines and rows of somatic muscle cells change direction and go over to the other side. Vulva 0.26–0.35 mm., anus 0.14–0.15 mm. from tail tip. Eggs 0.095–0.12 mm. by 0.05–0.06 mm.

Habitat.—Stomach, rarely intestine, of *Bos taurus* and rarely *Ovis aries*.

Localities.—Tokyo, Kagoshima (Japan).

In addition to these species there is still a fourth belonging to this genus reported by Travassos (1914) from the opossum (*Didelphis aurita*) in Brazil under the name of *Mecistocirrus didelphis*. Its description is inaccessible to me.

October 20th, 1921.

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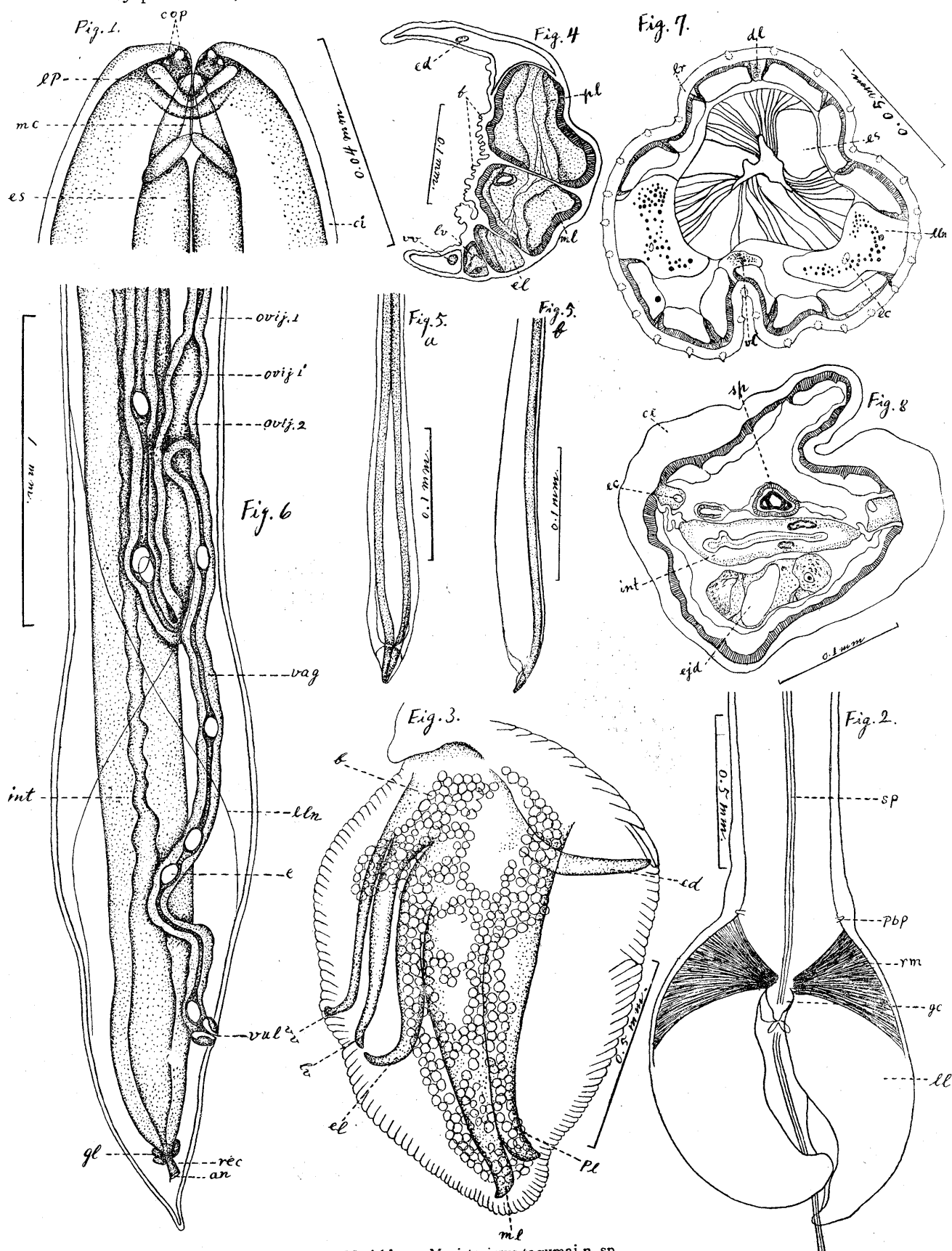
## Explanation of Plate.

### *Mecistocirrus tagumai*, n. sp.

- Fig. 1. Anterior extremity of body, dorsal view.  
 Fig. 2. Posterior extremity of male, showing bursa, dorsal view.  
 Fig. 3. Right lobe of bursa, inner view.  
 Fig. 4. A transverse section through middle part of left lobe of bursa.  
 Fig. 5. Spicule, terminal parts.  
     *a.* Dorsal view.  
     *b.* Ventral view.  
 Fig. 6. Posterior extremity of female, ventro-lateral view.  
 Fig. 7. A transverse section through anterior part of body, showing 30 longitudinal ridges in cuticle.  
 Fig. 8. A transverse section somewhat anterior to bursa showing lateral inflations of cuticle and connection of spicules.

an. anus.  
 b. bosses.  
 ci. cuticular inflation.  
 cop. circumoral papillae.  
 cp. conical process.  
 dl. dorsal line.  
 e. egg.  
 ec. excretory canal.  
 ed. externo-dorsal ray.  
 ejd. ejaculatory duct.  
 el. externo-lateral ray.  
 es. oesophagus.  
 gl. gland cells.  
 int. intestine.  
 ll. lateral lobe of bursa.  
 lln. lateral line.  
 lp. lip-like process.  
 lr. longitudinal ridge.

lv. latero-ventral ray.  
 mc. mouth cavity.  
 ml. medio-lateral ray.  
 ovij. 1. superior non-muscular part of ovijector.  
 ovij. 1. inferior non-muscular part of ovijector.  
 ovij. 2. common muscular part of ovijector.  
 pbp. prebursal papillae.  
 pl. postero-lateral ray.  
 rec. rectum.  
 rm. radial muscles.  
 sp. spicules.  
 vag. vagina.  
 vl. ventral line.  
 vu. vulva.  
 vv. ventro-ventral ray.



K. Morishita : *Mecistocirrus tagumai* n. sp.